

2. System Overview

In this section we present a brief overview of the pixel system and its relationship to the Inner Detector. The basic parameters of the pixel system are also summarized in this section.

The pixel detector is the innermost element of the Inner Detector as shown in Fig. 2.1. The pixel tracker is design to provide at least three points on a charged tracking emanating from the center of the collision region in ATLAS for pseudo-rapidity $|\eta| \leq 2.5$, as are the other tracking systems in the Inner Detector.

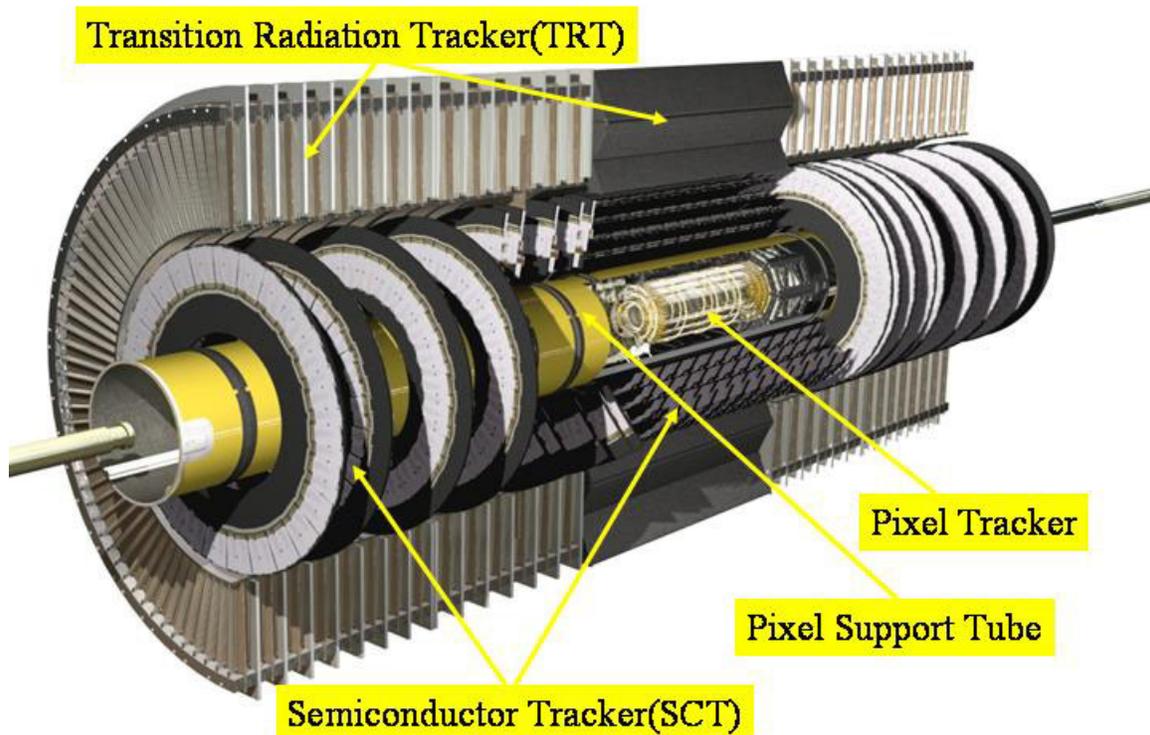


Fig. 2.1 ****Placeholder*** Need different figure, more labels

The principal components of the pixel tracking system are the following:

- active region of the pixel detector, which itself is composed of three barrel layers and a total of six disk layers, three at each end of the barrel region;
- internal services(power, monitoring and cooling) and their associated mechanical support structures(also supporting the interaction region beam pipe) on either end of the active detector region;
- a Pixel Support Tube into which the active region and the services and related support structures are inserted and located; and

- external services(not shown in Fig. 2.1) that are connected to the internal services at the end of the Pixel Support Tube.

The active region of the pixel detector is shown in a schematic view in Fig. 2.2. The active part of the pixel system consists of three barrel layers – Layer 0(so-called b-layer), Layer 1 and Layer 2 – and two identical endcap regions, each with three disk layers.

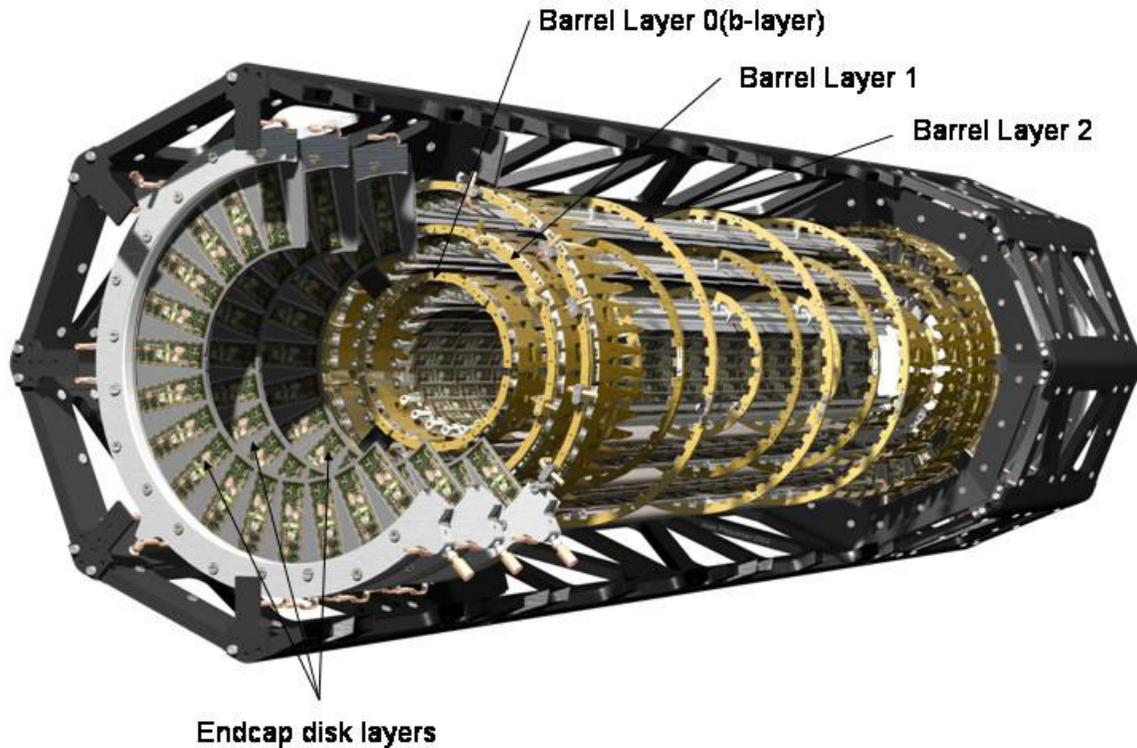


Fig. 2.2 ***Placeholder**** Need higher res, better labels, already shown?

The basic building block of the active part of the pixel detector is a module(section 6) that is composed of silicon sensors(section 5) and front-end and control integrated circuits(section 4) along with module interconnections(flexible circuit board hybrid). All modules are functionally identical at the sensor/integrated circuit level but differ somewhat in the interconnection schemes for barrel modules and disk modules. The pixel size is 50 microns in the ϕ direction and 400 microns in z (barrel region, along the beam axis) or r (disk region) (apart from a few special pixels in the overlap region between integrated circuits on a module – see sections 5 and 6).

Need good drawings with dimensions or at least better end views than exist now if we want to include figures for barrel layout and disk layout*

The essential parameters of the barrel region of the pixel detector system are summarized in Table 2.1. Modules are mounted on mechanical/cooling supports – staves – in the

barrel region. Thirteen modules are mounted on a stave and the stave layout is identical for all layers. The active length of each barrel stave is approximately 801 mm. More details are given in section 7.

Layer Number	Mean Radius (mm)	Number of Staves	Number of Modules	Number of Pixels	Active Area(m ²)
0	50.5	22	286	13,178,880	0.28
1	88.5	38	494	22,763,520	0.49
2	122.5	52	676	31,150,080	0.67
TOTALS		112	1456	67,092,480	1.53

Table 2.1. Basic parameters of the barrel region of the ATLAS pixel detector system.

The two endcap regions are identical. Each is composed of three disk layers and each disk layer is identical. The basic parameters of the endcap region are given in Table 2.2. Modules are mounted on mechanical/cooling supports – sectors. There are eight identical sectors in each disk.

Disk Number	Mean Z (mm)	Number of Sectors	Number of Modules	Number of Pixels	Active Area(m ²)
0	495	8	48	2,211,840	0.0475
1	580	8	48	2,211,840	0.0475
2	650	8	48	2,211,840	0.0475
TOTAL ONE ENDCAP		24	144	6,635,520	0.14
TOTAL BOTH ENDCAPS		48	288	13,271,040	0.28

The total number of pixels in the system is approximately 80 million and the active area is about 1.7 m².